



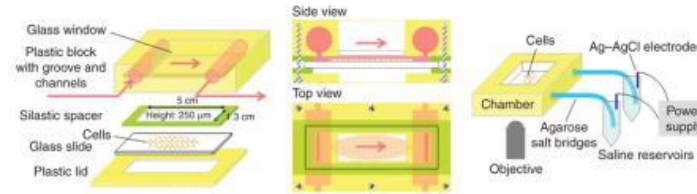
BENCHMARKING

MSD I

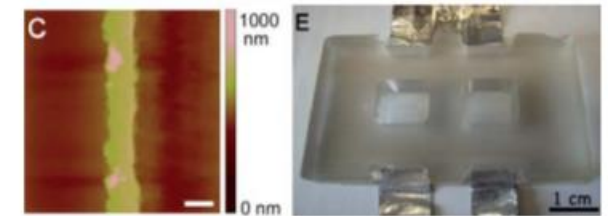
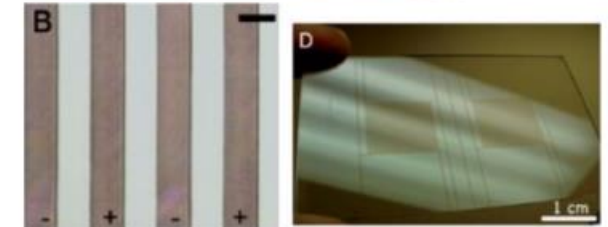
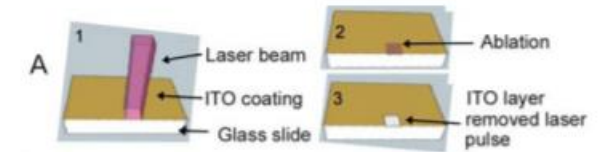
DESCRIPTION OF RESEARCH IDEAS/PROTOTYPES



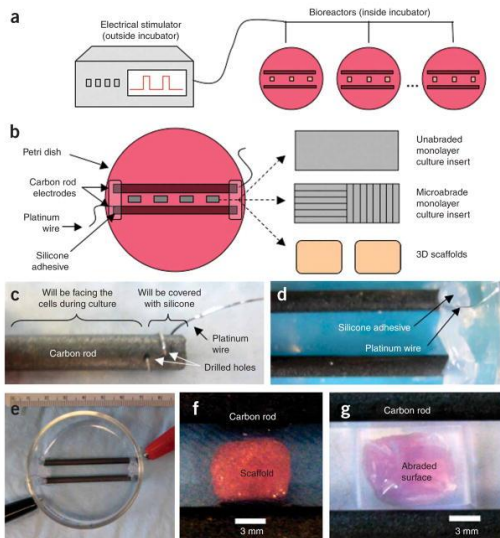
Bailey's Prototype: Petridish with electrodes at opposite end of the dish held in place by silicone



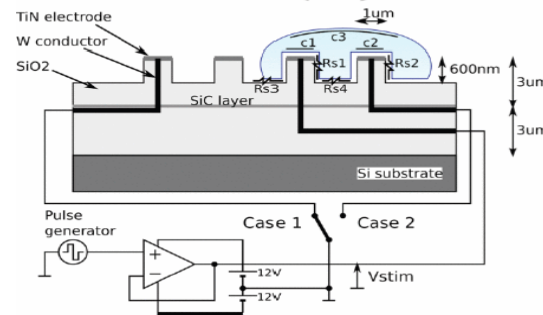
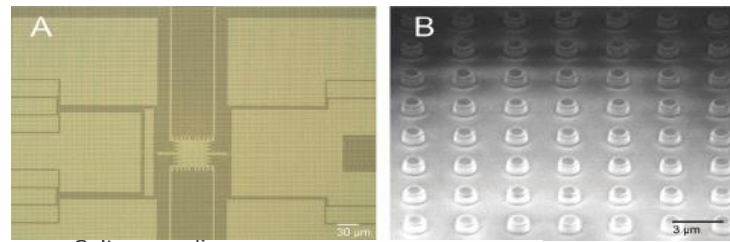
Parallel-plate Flow Chamber: Standard parallel-plate flow chamber with fluid flow replaces with salt bridges.



Redesigned Glass Slide: Glass slide with a thin layer of indium tin oxide (ITO) on the surface (the ITO serves as an electrode with wires connected to the positive and negative ends)



Redesigned Petridish: Petridish with carbon electrodes



TiN Sheet of Nails: Sheet of nails formed by lithography with a light-field mask of circles centered around the electrodes

BENCHMARKING TABLE

Product/Idea	Electrode Distance	Electrode Length	Electrode Material	Current	Voltage	Frequency	Resistance	Seeding Density	Container/Contraption Dimensions	Cell Type	Stimulation Duration
Bailey's Prototype	Varies based on assembly	N/A	Carbon	-	10 V 2V	5 Hz	N/A	Unknown; seeded for confluency	variable due to assembly of silicone	P19 (mouse embryonic carcinoma cell line)	23 days (10 days preculture)
Parallel-plate flow chamber	N/A	N/A	Ag–AgCl electrode (one positive: anode, one negative: cathode)	3mA	6 V	-	-	40,000 cells	(5, 1.3, 0.250 cm) (length, width and height/gap distance)	NIH 3T3 mouse embryo fibroblast cell line	3 days
Redesigned Petri-dish	1 cm	1. 5.7 cm 2. 9.7 cm	Carbon	-	5 V	1 Hz	1. 20 ohms 2. 10 ohms	1.35×10^8 cells/cm ³	1. 60 mm diameter 2. 100 mm diamter	Mouse muscle cell line C2C12	8 days
Redesigned Glass Slide	180 - 200 um	2mm (approx.)	Indium tin oxide (ITO)	-	Cardio: 500 mV Adipose: 20 mV	Both: 1 Hz Time duration (cardio): 1 ms Time duration (adipose): 2 ms	Sheet resistance: 4 - 8 ohm Uncertain of resistance of strip	Cardiomyocytes: 100,000 cells/cm ² hASCs: 5000 cells/cm ²	Bioreactor wells: 1 cm x 1 cm	Cardiomyocytes: neonatal rat heart ventricles Adipose: human adipose tissue-derived stem cells	Cardiomyocytes: 4 days (3 days preculture) Adipose: 6 days (1 day preculture)
TiN Sheet of electrode nails	3 um	1 um	TiN (titanium nitride)	-	100mV-2V	N/A	N/A	60,000 cells/ml 40,000 cells/mL	Nails: 500 nm to 1 um high with diameter of 1 um	Neuroblastoma (N2A) cells were purchased from ATCC (CCL-131); Hearts of 16-day old Wistar rat embryos	~ 2 minutes